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David L. Larkin

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UNITED STATES PATENT AND TRADEMARK OFFICE

BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES

Ex parte DAVID L. LARKIN, GEORGE E. HARRIS,
and WILLIAM D. SMITH

Appeal 2009-001599
Application 09/988,651
Technology Center 2800

Decided:¹ July 27, 2009

Before BEVERLY A. FRANKLIN, LINDA M. GAUDETTE, and
MICHAEL P. COLAIANNI, *Administrative Patent Judges*.

GAUDETTE, *Administrative Patent Judge*.

DECISION ON APPEAL

Appellants appeal under 35 U.S.C. § 134(a) from the Examiner's

¹ The two-month time period for filing an appeal or commencing a civil action, as recited in 37 C.F.R. § 1.304, begins to run from the Decided Date shown on this page of the decision. The time period does not run from the Mail Date (paper delivery) or Notification Date (electronic delivery).

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decision twice rejecting claims 12-29 (Office Action, mailed Mar. 6, 2007), the only claims pending in the application. We have jurisdiction under 35 U.S.C. § 6(b).

We AFFIRM.

STATEMENT OF THE CASE

Claims 12 and 21 are illustrative of the subject matter on appeal, and are reproduced from the Claims Appendix to the Appeal Brief (“App. Br.”), filed May 24, 2007:

12. A semiconductor device manufactured using the following process:

providing a semiconductor device having at least one metal layer completed;

then applying a planarizing dielectric layer on top of the semiconductor device and the metal layer; and

then providing a hydrogen treatment until hydrogen diffuses throughout and substantially saturates the semiconductor device.

21. A semiconductor device manufactured using the following process:

providing a semiconductor device having thereon at least one metal layer completed; and

then providing a hydrogen treatment until hydrogen diffuses throughout and substantially saturates the semiconductor device.

The Examiner relies on the following evidence to establish unpatentability (Examiner’s Answer (“Ans.”), mailed Jan. 8, 2008, 4):

Mora	4,920,077	Apr. 24, 1990
Chen	5,866,945	Feb. 02, 1999
Ino	5,888,839	Mar. 30, 1999

Appellants request review of the following grounds of rejection (App. Br. 3):

1. claims 12-29 under 35 U.S.C. § 112, second paragraph, as indefinite;
2. claims 12-29 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement;
3. claims 12-14, 20-23, and 29 under 35 U.S.C. § 102(e) as anticipated by Ino;
4. claims 21-23 under 35 U.S.C. § 102(b) as anticipated by Mora;
5. claims 12-14, 19-23, 28 and 29 under 35 U.S.C. § 102(e) as anticipated by Chen; and
6. claims 15-18 and 24-27 under 35 U.S.C. § 103(a) as unpatentable over Chen.

Rejection under 35 U.S.C. § 112, second paragraph, as indefinite

The issue presented for our review is whether Appellants have shown reversible error in the Examiner's determination that the term "substantially saturates" in claims 12 and 21 renders the claims indefinite. We determine that Appellants have shown reversible error for the reasons discussed below.

The invention is directed "to a method for decreasing CHC [(channel hot carrier)] degradation" (Spec. 1), a phenomenon causing semiconductor device performance degradation (Spec. 2:5-7). According to the Specification,

[i]t has been theorized that contaminants migrate through the semiconductor device and encounter "dangling bonds". . . . It is also theorized that if the bonds can be pacified, contaminants are less likely to combine with the dangling bonds and degrade the device.

Another theory concerning CHC degradation is that contaminants are small enough to diffuse through the semiconductor device and accumulate, leading to degradation of performance. It is theorized that heat can cause an added element to bond to the contaminant, thus rendering the contaminant too large to diffuse through the semiconductor device.

Spec. 3:16-4:2.

The invention employs a hydrogen treatment to “either pacify any dangling bonds . . . or cause the hydrogen to bond with contaminants, thereby making the contaminant too large to diffuse through [the] semiconductor device.” (Spec. 8:2-7.)

In one embodiment, [the] hydrogen treatment involves placing semiconductor device 10 in a hydrogen rich environment and heating semiconductor device 10 in that environment until hydrogen has saturated completely within semiconductor device 10. Other hydrogen treatments include any process that will introduce hydrogen throughout semiconductor device 10, including introducing hydrogen in situ using a plasma process. Alternatively, the hydrogen can be implanted directly using ion implantation.

(Spec. 7:23-8:2.)

““A determination of claim indefiniteness is a legal conclusion that is drawn from the court’s performance of its duty as the construer of patent claims.”” *Tech. Licensing Corp. v. Videotek, Inc.*, 545 F.3d 1316, 1338 (Fed. Cir. 2008) (quoting *Personalized Media Commc’ns, LLC v. Int’l Trade Comm’n*, 161 F.3d 696, 705 (Fed. Cir. 1998)). A claim satisfies the definiteness requirement of 35 U.S.C. § 112, second paragraph, when one skilled in the art understands the claim parameters as read in light of the specification. *Personalized Media*, 161 F.3d at 705. When “substantially” is used in a claim as a word of degree, it is necessary to look to the

Specification to determine a standard for measuring that degree. *See Seattle Box Co. v. Indus. Crating & Packing, Inc.*, 731 F.2d 818, 826 (Fed. Cir. 1984).

The Examiner maintains that “substantially saturates” in claims 12 and 21 “is a relative term, which renders the claim[s] indefinite.” (Ans. 5.) However, reading this term in light of the Specification, we are in agreement with Appellants that the ordinary artisan would understand the scope of the invention. As indicated by Appellants, one of ordinary skill in the art would understand the term “saturation” as referring to a state in which there are no available bond sites.² (*See App. Br. 4.*) Thus, the ordinary artisan would readily understand, both from his own knowledge and upon review of the Specification, that the qualifying term “substantially” refers to a condition in which “an insignificant number of such sites may not become saturated” (*App. Br. 4.*). Indeed, the Specification describes one embodiment in which “hydrogen has *saturated completely* within [the] semiconductor device,” as well as “[o]ther hydrogen treatments . . . that will introduce hydrogen *throughout* [the] semiconductor device” (*Spec. 7:26-29 (emphasis added)*). (*See also*, original claim 1 (“providing a hydrogen treatment until hydrogen diffuses throughout the semiconductor device”).)

For the foregoing reasons, Appellants have shown reversible error in the Examiner’s determination that the term “substantially saturates” in claims 12 and 21 renders the claims indefinite. Accordingly, we do not

² *See, e.g., Webster’s Encyclopedic Unabridged Dictionary of the English Language* 1705 (1996 ed.) (Saturate: “to cause (a substance) to unite with the greatest possible amount of another substance, through solution, chemical combination, or the like.”).

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sustain the rejection of claims 12-29 under 35 U.S.C. § 112, second paragraph, as indefinite.

Rejection under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement

The issue presented for our review is whether Appellants have shown reversible error in the Examiner's finding that the term "substantially saturates" renders the claimed invention broader in scope than the subject matter described in the original Specification and claims. We determine that Appellants have shown reversible error for the reasons explained below.

Whether an applicant has complied with the written description requirement is a finding of fact, to be analyzed from the perspective of one of ordinary skill in the art as of the date of the filing of the application.

In re Alonso, 545 F.3d 1015, 1018-1019 (Fed. Cir. 2008). In determining whether an Applicant has complied with the written description requirement, the pertinent question is whether a person skilled in the art would understand from the earlier application alone, without consulting the new matter in the subsequent application, that the inventor had possession of the claimed limitation when the earlier application was filed. *Tech. Licensing Corp. v Videotek, Inc.*, 545 F.3d 1316, 1333-34 (Fed Cir 2008). Although the later claimed subject matter need not be expressed in *ipsis verbis* in the application disclosure as originally filed, it is nonetheless necessary that the written description of the application, as originally filed, must clearly allow persons of ordinary skill in the art to recognize that the inventor invented what is claimed. *See also, In re Gosteli*, 872 F.2d 1008, 1012 (Fed. Cir. 1989); *In re Howarth*, 654 F.2d 103, 105 (CCPA 1981) ("An inventor need not . . . explain every detail [of the invention] since he is speaking to those

skilled in the art. What is conventional knowledge will be read into the disclosure.”).

The Examiner contends that the “specification simply does not convey that appellants envisioned, at the time of filing, decreasing CHC degradation by only *substantially* saturating the device with hydrogen without *completely* saturating it.” (Ans. para. bridging 8-9.) As acknowledged by Appellants, the desired result of their invention is to reduce the risk of contaminants (*see* Rep. Br. 2), and this result is optimally achieved through *complete* saturation, i.e., by pacifying *all* dangling bonds which could combine with contaminants or by causing hydrogen to bond with *all* contaminants small enough to diffuse through the semiconductor device and accumulate. However, as pointed out by Appellants, the ordinary artisan, upon reading the original Application, would have appreciated that the desired result of the invention could still be achieved under somewhat less than optimal conditions. (Rep. Br. 2.) As discussed above (*see supra* pp. 4-5), the Specification identifies a preferred embodiment in which the device is completely saturated, but also suggests that the risk of contaminant degradation is still reduced where hydrogen diffuses throughout, but does not necessarily completely saturate the device, leaving an insignificant number of dangling bonds or contaminants small enough to diffuse through the device.

For the foregoing reasons, Appellants have shown reversible error in the Examiner’s finding that the term “substantially saturates” renders the claimed invention broader in scope than the subject matter described in the original Specification and claims. Accordingly, we do not sustain the rejection of claims 12-29 under 35 U.S.C. § 112, first paragraph, as failing to comply with the written description requirement.

*Rejections under 35 U.S.C. § 102 – Ino, Mora, and Chen and the
Rejection under 35 U.S.C. § 103*

Having considered the respective positions of the Examiner and the Appellants, we determine that the issue presented with respect to each of the prior art rejections is whether Appellants have shown that the Examiner reversibly erred in finding that the Ino, Mora, and Chen devices contain diffused hydrogen and, therefore, appear to be identical to the semiconductor device of the appealed claims.³ We determine that Appellants have not shown reversible error for the reasons discussed below.

Appellants contend that the references fail to anticipate the appealed claims because there is no teaching of manufacturing a semiconductor device by substantially saturating the device with hydrogen, nor is there a disclosure of using hydrogen for the purpose of decreasing CHC degradation. (*See App. Br. 5-7.*)

However, the Examiner finds, and Appellants do not dispute (*see Ans. 14; see generally, Rep. Br.*) that:

1. The claims do not recite the use of hydrogen for the purpose of decreasing CHC degradation. (*Ans. 15.*)
2. The claims are drafted in product-by-process format and, therefore, do not limit the final, claimed semiconductor device to one which is substantially saturated with hydrogen. (*See Ans. 14.*)
3. One of ordinary skill in the art would be aware that hydrogen diffuses out of silicon over time, so the level of hydrogen in the semiconductor's *final* structure will be lower than the hydrogen level immediately following the hydrogenation treatment. As such, even a device

³ Appellants' arguments relate to limitations found in both independent claims 12 and 21. (*See App. Br. 5-6.*)

that was initially ‘completely saturated’ with hydrogen would eventually lose hydrogen until it is less than saturated.

(Ans. 14.)

4. Ino, Mora, and Chen disclose semiconductor devices containing diffused hydrogen. (*See* Ans. 6-8 and citations to references.)

“The patentability of a product does not depend on its method of production. If the product in a product-by-process claim is the same as or obvious from a product of the prior art, the claim is unpatentable even though the prior product was made by a different process.” *In re Thorpe*, 777 F.2d 695, 697 (Fed. Cir. 1985) (citations omitted).

Where . . . the claimed and prior art products are identical or substantially identical, or are produced by identical or substantially identical processes, the PTO can require an applicant to prove that the prior art products do not necessarily or inherently possess the characteristics of his claimed product. Whether the rejection is based on ‘inherency’ under 35 U.S.C. § 102, on ‘prima facie obviousness’ under 35 U.S.C. § 103, jointly or alternatively, the burden of proof is the same, and its fairness is evidenced by the PTO's inability to manufacture products or to obtain and compare prior art products.

In re Best, 562 F.2d 1252, 1255 (CCPA 1977) (citations omitted). *See also*, *In re Spada*, 911 F.2d 705, 708 (Fed. Cir. 1990).

Appellants argue that the references fail to disclose the use of a hydrogen treatment step as claimed in manufacturing their devices. However, Appellants have not presented arguments or evidence to refute the Examiner’s finding that, regardless of the manufacturing methods used in the references, the final devices contain diffused hydrogen and, therefore,

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would appear to be identical to Appellants' claimed semiconductor device. Accordingly, Appellants have not met their burden of establishing that the recited process steps would result in a device having patentably distinct characteristics from the devices produced by the applied prior art processes.

Because Appellants have not shown reversible error in the Examiner's findings of anticipation, we sustain the rejections of claims 12-14, 20-23, and 29 under 35 U.S.C. § 102(e) as anticipated by Ino; claims 21-23 under 35 U.S.C. § 102(b) as anticipated by Mora; and claims 12-14, 19-23, 28 and 29 under 35 U.S.C. § 102(e) as anticipated by Chen.

In response to the rejection of claims 15-18 and 24-27 under 35 U.S.C. § 103(a) as unpatentable over Chen, Appellants rely on the same arguments in support of patentability of claim 12. (App. Br. 7.) Having found these arguments unpersuasive for the reasons stated above, we likewise sustain this ground of rejection.

CONCLUSION

The rejections under 35 U.S.C. § 112, first and second paragraphs, are reversed. The rejections under 35 U.S.C. §§ 102 and 103 are affirmed.

The decision of the Examiner rejecting claims 12-29 is affirmed.

No time period for taking any subsequent action in connection with this appeal may be extended under 37 C.F.R. § 1.136(a)(1)(v).

AFFIRMED

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ssl

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